

APPENDIX 7

Development Procedures for Wellfield Activities

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1.0 INTRODUCTION

These development procedures include plans prepared by Ultra Resources, Inc., Shell Exploration & Production Company, and Questar Market Resources including Operator committed mitigation. The plans include a Transportation Plan (Appendix 5), Reclamation Plan (Appendix 8), Hazardous Materials Summary (Appendix 12), and Wildlife and Habitat Mitigation Plan (Appendix 9).

2.0 DEVELOPMENT PROCEDURES

Drilling and development operations would continue year-round and may utilize as many as 48 drilling rigs operating in the PAPA. However, depending on the Alternative selected, some areas would be restricted for winter drilling. Approximately 300 wells per year would be drilled in the PAPA during peak drilling.

Traffic and Workforce

The traffic volume in and out of the PAPA varies seasonally. During the development period (through 2023), traffic would be much greater in summer than in winter due to construction traffic required for construction of roads, pads and pipelines. Workers, material and equipment would be transported to the project area over U.S. Highways 191 and 189, State Highway 351, and county and BLM roads located within the PAPA. A comparison of traffic requirements for each of the Alternatives for 2009 with and without the Shell and Ultra's liquids gathering system is provided in Table 1 below. A Transportation Plan is provided as Appendix 4.

Table 1
Comparison of Traffic (vehicles per day)
During Development for all Alternatives in 2009

	Alternatives A and E ¹			Alternatives B, C and D		
	Light	Heavy	Total	Light	Heavy	Total
Summer	1,917	1,061	2,978	622	600	1,222
Winter	1,547	692	2,239	521	448	969

¹ Shell/Ultra liquids gathering system is not included in Alternatives A and E.

Workforce Requirements. Estimated workforce requirements to develop a single well in the PAPA are provided in Table 2 and workforce requirements necessary to operate and maintain a single well are provided in Table 3.

Table 2
Workforce Requirements Necessary to Develop A Single Well in the PAPA

Category	Average Number of Workers	Average Number of Days
Well Pad and Access Road Construction	15	5
Rig U/Down	15	5
Drilling	25	50
Testing and Completion	20	12

Table 3
Workforce Requirements Necessary to
Operate and Maintain a Single Well^{1,2}

Development Scenario	Average Number of Workers
With liquids gathering system	0.076
Without liquids gathering system	0.120
¹ Estimates include field and office employees and contractors.	
² Assumes 4,800 producing wells (existing and projected).	

Preconstruction Planning and Site Layout

Pursuant to *Onshore Oil and Gas Order No. 1* and BLM regulation 42 CFR § 3162.3-1, each proposed well would require an Application for Permit to Drill (APD) approved by BLM prior to any surface disturbance. Each APD includes site-specific information regarding all facets of well development, including environmental concerns. Operators and/or their contractors and subcontractors would be required to conduct all phases of project implementation (e.g., well pad construction, road and pipeline construction, drilling and completion operations, maintenance, reclamation, and abandonment) in full compliance with all applicable federal, state, and county plans, laws, and regulations and according to approved APD specifications, right-of-way (ROW) permits, and potentially site-specific environmental assessments (EAs) and decision records (DRs). Pursuant to section 390 of the Energy Policy Act of 2005, Pub. L. No. 109-58, § 390(b)(3), 119 Stat. 747-48 (2005), the BLM may exclude from NEPA documentation the approval of individual APDs within a developed field when a NEPA document has been prepared. Operators would be fully accountable for their contractors' and subcontractors' compliance with the requirements in the approved permits and/or plans.

When development of federal minerals would take place on private surface, Operators would follow *Onshore Oil and Gas Order No. 1* and regulations with regard to access for natural gas resource development and remuneration to the landowner for potential damage.

Construction and Drilling Operations

All activities at each well in the PAPA would follow procedures approved by the BLM in the APD and attached Conditions of Approval (COAs). Well pad, access road, and other construction activities would follow guidelines set forth in the most recent edition of the "Gold Book," *Surface Operating Standards for Oil and Gas Exploration and Development*, and/or *Manual 9113 Roads* concerning road construction standards on projects subject to federal jurisdiction. Sufficient topsoil to facilitate revegetation would be segregated from subsoils during all construction and would be replaced on the surface upon completion of operations as part of the reclamation and revegetation program. Operators would employ appropriate topsoil storage technology and procedures to ensure soil viability and plant rooting potential are maintained. When topsoil piles exceed 3 feet in height or will be stored for 2 years or longer, Operators would develop a plan for BLM approval that details methods and/or procedures to maintain or replace soil microbial and nutrient viability for reclamation.

Well Pads

Major components of each individual well pad include the following:

- a level drilling area for placement and support of the drilling rig and related equipment, production facilities, and storage tanks;

- if approved, an earthen reserve pit to contain drilling fluids, drilled cuttings, and fluids produced during the drilling operation; and
- an earthen flare pit for the safe ignition of flammable gases produced during drilling and permitted completion and testing operations.

The entire well pad area would be cleared of all vegetation, and up to 12 inches of topsoil would be removed from all cut, fill, and/or subsoil storage areas. Topsoil would be stockpiled for future use in reclamation. After the topsoil has been removed, the pad would be graded to prepare a level working surface. Each well location would be designed so that the amount of cut and fill material would “balance,” where feasible, thereby minimizing the need to stockpile excess subsoil adjacent to the well location until site reclamation. Materials excavated from the reserve pit (if such pit is approved) would be stockpiled adjacent to the reserve pit and used to backfill the pit during reclamation.

The area required for drilling and completion of each well would vary depending upon the total number of wells to be developed from the pad, and whether new development would occur from an existing pad. In general, single well pads would require 5 to 10 acres, and directional well pads with multiple wells would require from 6 to 28 acres.

Erosion control would be maintained through prompt revegetation and by constructing surface water drainage controls such as berms, diversion ditches, and sediment ponds as necessary at each well location. All diversion ditches and other surface water and erosion control structures at each location would be shown on topographic relief maps provided with each APD. Storm Water Pollution Prevention Plans (SWPPPs) would be prepared by each Operator for all wells, access roads, and other disturbances of more than 1 acre, in compliance with the Wyoming Department of Environmental Quality (WDEQ) Water Quality Division requirements.

Roads

Roads would be designed by a licensed professional engineer if deemed necessary by the BLM (i.e., in problem areas such as steep slopes, unsuitable soils), and all roads would be built in accordance with guidelines established for oil and gas exploration and development activities in *BLM Manual* Section 9113. On completion of construction activities, the engineer would certify that the road was constructed in accordance with the approved road construction design, if deemed necessary by the BLM. Any deficiencies would be corrected to ensure compliance with both the approved Road Construction Plan and the APD. Once resource road construction is complete, all but 35 feet of the ROW (road surface area and portions of borrow ditch) would be reclaimed and revegetated.

Aggregates used for road and well location construction would be acquired from commercial sources in and adjacent to the PAPA. Prior to aggregate extraction, appropriate permits would be obtained from the BLM and/or WDEQ/Land Quality Division (LQD) and WDEQ/Air Quality Division (AQD), as appropriate. Aggregates would be free of noxious weeds.

Drilling Operations

Up to 48 drilling rigs rated for drilling to depths of 14,000 feet or more may be operating simultaneously during project development to accommodate development of approximately 300 wells per year. All drilling operations and other well site activities would be conducted in compliance with applicable BLM, Wyoming Oil and Gas Conservation Commission (WOGCC), WDEQ, and other federal, state, and county rules and regulations. Including rig-up and rig-

down activities, drilling each well would take an average of approximately 50 days.

Directional drilling provides for the construction of a single well pad that may accommodate as many as 32 wells (consolidated well pad). The initial and LOP disturbance required for each consolidated well pad is increased over that for a pad with a single well, however, there are fewer total pads for a given number of wells. Consolidated well pads may be serviced by one access road and gathering system pipeline, as well as a single separation, dehydration, and storage facility. Where new directional wells are developed at an existing well site, separate separation, dehydration, and storage facilities may be used.

Drilling operations would utilize either water-based or oil based mud system or both, with additives to minimize downhole problems. The quantity of water used in drilling and completion varies between Operator because of mud type, and the re-use of partially treated produced water in drill-out and fracturing. If water based mud is used throughout the hole and there is no re-use of produced water, as much as 40,000 bbl Wasatch well water may be required per gas well. Use of oil-based mud in drillout below casing and re-use of produced water in completions can reduce that requirement to less than 5,000 bbl per gas well. There are currently approximately 100 water supply wells in the PAPA, but it is proposed that each new consolidated well pad would have its own water supply well to avoid haulage and piping. Because they are located on drilling pads, new water supply wells would require no additional disturbance. The All water well would be permitted with the Wyoming State Engineer's Office (SEO).

Water might still be trucked or piped to some well pads from water wells and/or treatment facilities depending on site-specific conditions, disturbance requirements, and time of year. Water pipelines would be temporary and would consist of either standard 3-to 6-inch diameter aluminum sections or polypipe. These water pipelines would be laid on the ground surface within road ROWs or directly overland and would be removed after completion/testing operations are done.

Operators would utilize closed drilling systems (no reserve pits) for well locations where certain environmental conditions exist (e.g. high water table). If reserve pits are approved, Operators would remove/vacuum fluids from reserve pits within 1 year of all wells on the pad being put into production. If this timeframe is infeasible on a particular site, the Operators would notify the WOGCC or BLM and fluids would be removed as soon as practical. If oil-based fluids are used, they would be recovered in tanks. If any oil enters reserve pits, it would be removed pursuant to WOGCC rules and regulations and the pit would be flagged overhead or covered with netting to prevent waterfowl use in compliance with BLM Informational Bulletin Number WY-93-054.

Surface casing is set to isolate shallow water zones (alluvium and Wasatch). After drilling out each well and logging it, production casing is run and cemented effectively isolating all geologic formations and eliminating fluid migration between hydrocarbon-bearing zones and freshwater aquifers.

Completion Operations

Once the well has been drilled and cased, completion operations would begin to clean the wellbore, to conduct pressure testing, and to perforate potentially productive zones. A bond log would be run (a bond log tests the integrity of the cement bond between the casing and the borehole is verified), casing would be perforated in potentially productive zones downhole (e.g., Lance Pool sand lenses), fracture stimulated, and ultimately production tubing run. Multiple

sand lenses would be fracture-stimulated. Fracture-stimulation (fracturing) is the process by which fluids and proppants (typically water or nitrogen foam with sand) are pumped downhole under pressure through the casing perforations and into the formation. As the formation is fractured by applied pressure, the fractures are filled with sand to prop them open, so that they facilitate the flow of gas into the well.

Upon completion of fracturing, the well is flowed back to the surface to recover as much of the fracture fluid as possible and to clean excess sand out of the perforations. Production tubing might be permanently set, if warranted.

All fracture fluid additives would meet BLM and/or EPA requirements for disposal of oil field wastes. All fluids utilized in the completion procedure would be contained on the well pad in pits or tanks and disposed of in compliance with state and federal rules and regulations. Completion operations proposed for this project would continue to comply with the Wyoming DEQ-AQD flaring permits for the Pinedale Anticline operations.

If reserve pits are approved, Operators would remove/vacuum fluids from reserve pits within 1 year of all wells on the pad being put into production. If this timeframe is infeasible on a particular site, the Operators would notify the WOGCC or BLM and fluids would be removed as soon as practical. Off-lease disposal of fluids would be in strict accordance with all appropriate rules and regulations regarding the discharge, transport, and/or disposal of such fluids.

Interim reclamation of disturbed areas not needed for production would occur as specified in APDs. Up to 60 percent of the disturbed acres would be reclaimed during interim reclamation. After well completion, production equipment would be set, gathering pipelines installed, and the well placed on line, with production continuing as long as the well is capable of commercial production and a demand for the gas exists. Production equipment typically would include a “Christmas tree” at the wellhead (a series of valves designed to control pressures and regulate flows from the well); separators to segregate natural gas, condensate, and water; aboveground tanks for condensate and produced water storage with emission control devices to lower volatile organic compounds (VOCs) where required by WDEQ; a methanol tank and pump; a glycol dehydrator, with emission control devices to lower VOCs and hazardous air pollutants (HAPs) and pump; and a meter run for measurement of gas volumes produced into the pipeline. More or larger tanks would be required at multiple well pads. As gas production declines from wells, so does condensate and water production, and, over time, condensate and water tanks may be removed from well pads or smaller tanks may be substituted to accommodate reduced storage requirements for condensate and produced water.

All aboveground production facilities would be painted a standard environmental color that blends with the surrounding landscape, except for structures that require safety coloration to comply with Occupational Safety and Health Administration (OSHA) regulations.

Shell and Ultra Liquids Gathering System

Under Alternatives B, C, and D, Shell and Ultra plan to install a liquids gathering system to collect condensate and water from existing and future well pads. The piping right-of-way disturbance would be a short-term impact during piping construction and burial. Following installation of the piping, reclamation and seeding of right-of-ways would take place to restore the disturbed areas to a native state.

The liquids gathering systems would also require facilities for transporting, treating, and storing the collected liquids. These facilities will consist of central gathering facilities, which will include components such as: pumps, compressors, pressure vessels, tanks, liquids treating equipment, sales metering, and associated utilities systems necessary to provide power, heat, and other process needs.

Secondary pipelines would be necessary to transport the processed liquids from the central gathering facilities. These pipelines will be for condensate, water recycling and disposal, and for gas recovered from the facilities. Again, the sharing of right-of-ways has been considered in an effort to minimize surface disturbance associated with these secondary lines.